

Regional Director, Atlanta, Georgia

March 15, 196

Acting Chief, Branch of Wildlife Refuges

Okefenokee Refuge - July-December 1959, Biological Report

As Mr. Gillett predicted in his memorandum of February 24 transmitting the subject report, we found Biologist Cypert's findings regarding plant succession in the Okefenokee swamp to be of unusual interest and value. We are sure you will agree that, while such studies may not appear to make any immediate contribution to management, they are indispensable in understanding and setting long-range objectives in perspective.

(CCD.) WILLIAM E. ACKERKNECHT

Okefenokee Refuge

L.S. Givens 3/22/60

For your information.

# OKEFENOKEE NATIONAL WILDLIFE REFUGE

## BIOLOGICAL REPORT

JULY - DECEMBER  
1959

### I. ECOLOGICAL SUCCESSION FOLLOWING SILL CONSTRUCTION.

Due to high water on the Suwannee River during the late summer and fall, no other transects have been run. Now that the water level in the river is falling, it should be possible to resume the work soon.

### II. PRAIRIE ECOLOGY.

#### A. Plant Communities in Chesser Prairie.

Zonation of vegetation is obvious in Okefenokee Prairies. The ground surface in the houses is higher than the surrounding prairie and the slight differences in elevation surrounding the houses are indicated by distinct belts of plant communities.

A determination of the elevations of prairie plant communities was made by measuring the water depths. The water level at Camp Cornelia at 122.00' was arbitrarily selected as the standard and the depth measurements in Chesser Prairie were corrected as the levels at Camp Cornelia varied. For example, if the water level at Camp Cornelia was 122.06' on a given day, .06' was subtracted from the depth measurement that day.

Depths were measured in the following communities between August 4 and August 26:

1. Red Bay (Gordonia lasianthus) predominate. Associates: Pond Cypress (Taxodium distichum nutans), black-gum (Nyssa sylvatica biflora), titi (Cyrilla racemiflora), hurrah bush, (Desmodium lucidus), swamp fetherbush (Leucothoe racemosa), water willow (Decodon verticillatus), black bamboo vine (Smilax laurifolia), wampee (Peltandra virginica), paintroot (Gyrotheca tinctoria), chain fern (Woodwardia virginica), Sphagnum.
2. Chain fern-Sphagnum predominant. Associates: Wampee, paintroot, Carex hyalinolepis, Dulichium arundinaceum, bladderwort, (Utricularia fibrosa).

3. Carex hyalinolepis predominant. Associates: Sphagnum, wampee, neverwet (Orontium aquaticum), white water-lily (Nymphaea odorata), arrowhead (Sagittaria graminea), chain fern, paintroot, maidencane (Panicum hemitom), swamp fetterbush.
4. Maidencane predominant. Associates: Wampee, Sagittaria graminea, white water lily, paintroot, plume grass, (Erianthus saccharoides), chain fern, purple bladderwort (Utricularia purpurea), neverwet, spikerush (Eleocharis baldwinii), watershield (Brasenia schreberi), buttonbush (Cephalanthus occidentalis), pipewort, (Ericaulon sp.)
5. Wampee predominant. Associates: Chain fern, maidencane, paintroot, Sagittaria graminea, plume grass, (Eleocharis baldwinii), watershield, buttonbush, titi, water willow, swamp fetter bush, pond cypress. The community appears to be recent deposit at the edge of lakes and 'gator holes.
6. Beakrush predominant. Associates: White waterlily, neverwet, purple bladderwort, Eleocharis elongata.
7. Spikerush (Eleocharis elongata) predominant. Associates: White waterlily, neverwet, purple bladderwort.
8. Water lily-Neverwet predominant. Associates: Spike-rush, purple bladderwort, beakrush, hardhead (Xyris fimbriata).

Table 1.

Showing Elevations of Plant Communities in Chesser Prairie  
in Feet in Relation to Water Surface.

<u>Predominant Species</u>	<u>Number of Readings</u>	<u>Elevation in Relation to Water Surface</u>		
		<u>Low</u>	<u>High</u>	<u>Average</u>
Red Bay	25	-1.99 +.01	+1.14 +1.14	-1.19 +.81
Chain Fern-Sphagnum	30	-1.68 -.68	-.29 +.71	-.70 +.30
Carex	19	-1.95 -.95	-1.46 -.46	-1.69 -.69
Maidencane	53	-2.05 -.05	-1.54 -.54	-1.79 -.79
Wampee	45	-2.09 -.09	-1.42 -.42	-1.79 -.79
Beakrush	34	-2.16 -.16	-1.96 -.96	-2.09 -.09
Spikerush	12	-2.21 1.21	-2.10 -1.10	-2.15 -1.15
Water lily-neverwet	70	+2.21 1.21	-1.66 -.66	-1.94 -.94

Obviously the elevation and the <sup>but</sup> amount of flooding governs to a great extent the type of community ~~that~~ other factors must enter in. For example, there does not appear to be any significant difference between the elevations in the maidencane community and in the wampee community. The maidencane is probably better adapted to survive drouth than the wampee because it is commonly found surrounding houses in comparatively firm muck where wampee is rarely found. The wampee is common in the softer muck adjacent to 'gator holes and lakes. These locations probably have more moisture during dry periods.

There does not appear to be any significant difference between the elevations of the beakrush, the spikerush, and the water lily-never-wet communities. They all appear to occupy the same kind of site. In some places, one will predominate and in other places one of the others will predominate but the same species are always associated regardless of which predominates. Probably these should all be lumped together.

## B. Ecology of Batteries and Houses.

### 1. The Formation of Batteries and Houses.

That the Okefenokee prairies are the result of severe fires in past years, there can be little doubt. Many old charred stumps embedded in the peat are evidence of over forested areas that are now open prairie. Numerous lakes and 'gator holes throughout the prairies, have been shown in an earlier report to be pits in the peat that have no relation to the topography of the underlying sand floor of the swamp. It is known that peat fires characteristically burn out pockets in the peat. The Okefenokee prairie lakes and 'gator holes are most likely the results of such peat burns.

The elevation of the prairies is slightly lower than the forested and scrub areas of the swamp. This small difference in elevation is enough to prevent the establishment of woody vegetation, Water lily, never-wet, bladderwort (Utricularia purpurea and U. fibrosa), Spike-rush (Eleocharis elongata), floating heart (Nymphoides aquaticum), and beakrush are predominant species of the lower elevations of the prairies.

Occasional drouths result in accelerated oxidation of the peat and offset much of the peat accumulation which takes place during the periods that the prairies were inundated. The result is that the peat accrual in the open areas is very slow.

The reversion of the prairies to woodland is taking place much more rapidly than it would with normal peat accrual. Formation of "batteries" with the resultant "houses" greatly accelerates the succession toward the swamp forest.

"Battery" is the local name for masses of floatant composed of peat, litter and thriving vegetation. I am told that some of the older natives of a generation ago spoke of these floating masses as "batches". The present name is probably a corruption of this word.

Sometimes the batteries sink and become a part of the peat bed. More often they continue to float. Since their surface is continuously at or slightly above the water surface, favorable habitat is afforded a greater variety of plants which grow more profusely than the aquatic vegetation of the prairies. The order of succession is from herbaceous marsh plants such as arrowhead, beakrush, pickerel weed, maidencane, spikerush and paintroot to shrubby growth such as water willow, button bush, titi and smilax. Usually by this stage, the battery has built up enough bulk to have established contact with the underlying peat. Then larger trees such as pond cypress, cassena, red bay, white bay and sweet bay take over.

By the time the succession is thus far advanced, the community is known in Okefenokee lingo as a "house". Houses of all ages, from incipient clumps of shrubs to those covered in aged trees dot the prairies, covering a large portion of them. It is obvious that the prairies are reverting to forest, not because the peat is steadily building up to an elevation high enough to support woody growth but, rather because of the phenomenon of battery formation and the resultant houses.

In his report of November, 1940, Hayden Carter described the evolution of houses from a free floating battery such as is sketched in Figure 1. In my investigations of the past year, I have found that there are two other types of batteries. Besides the free floating battery, there is a kind in which a surface layer of peat becomes separated from the deeper peat and rises to the top but never breaks loose from the unrisen surface peat, a sort of bulge in the peat surface, (Figure 2), and a kind which develops from floatant at the edge of lakes and 'gator holes, (Figure 3).

The free floating batteries are the least common of the three. They occur in cases where the surface crust or water lily root mat has been broken, as where boat trails are constructed and the loose gas impregnated peat is released and floats to the surface, or where a mass of turf, which may have been formed in time of low water, breaks loose and floats to the surface with the rise of water levels.

The bulge type (Figure 2) of battery formation occurs commonly in some years, probably because of certain changes in water levels and temperature. Many new batteries of this type rose in Chesser and Chase Prairie this past year. It appears that large areas of swamp scrub on the eastern side of Chase Prairie resulted from this type of battery. There are also examples in Chase Prairie where this kind of battery was formed in 1957 or 1958 and sank this year, as is evidenced by patches of flooded out marsh vegetation.

The type of battery which forms at the edge of 'gator holes and lakes (Figure 3) is the most common of the three. Apparently these batteries begin by loose bits of floating material which drifts to the edge of the water and remains there as a floating mass. This serves as base for the growth of algae and, as the mass accumulates, the little spikerush (*Eleocharis baldwinii*) enters. Then, as this floatant increases, larger plants such as maidencane (*Panicum hemitomon* and *Sacciolepis striata*) enter and grow into a bulky floating mat. Sometimes these maidencane mats will cover the entire surface. (Figure 2). More often, though, as the bulk builds up, other vegetation intrudes. Pickerel weed (*Pontederia cordata*) commonly forms a dense persistent semi-floating mass. Then as the decomposed vegetation fills in the space between the battery and the underlying peat, a variety of marsh plants invade. The evolution of the house from here on is much the same as that from the other types of batteries. Wampee, arrowhead (*Sagittaria graminea* and *Sagittaria longirostrata*), bur marigold (*Bidens coronata*), paintroot, sphagnum, pennywort (*Hydrocotyl umbellata*), hardhead, plume grass and others enter. Usually the first woody plants to become established, sometimes while the mat is still afloat, are water willow and button bush. As the mass builds up, other woody species intrude. Swamp fetterbush, titi and, later, pond cypress. Cassena (*Ilex cassine*), bamboo vine, sweet bay (*Persea pubens*), white bay (*Magnolia virginiana*), red bay and hurrah bush.

The battery usually extends gradually until the entire 'gator hole becomes a house. It may seem strange but the house which evolves from floatant on open water has a higher elevation than the prairie and yet it was formed at a place where the water was deeper than that on the rest of the prairie. Usually, where there is now a house, there was once a 'gator hole or a lake.

In Floyd's Prairie, there is a more pronounced current than in other prairies. Here, most of the batteries and houses which have not yet covered the open water, are on the downstream side.

The encroachment of floatant over the open water is usually gradual so that the development of the house is not far behind. Sometimes, though, the floating mat develops quite rapidly as in the case of a small lake in Sapp Prairie which, only a few years ago was some six or seven acres of open water, but is now entirely covered.

## 2. Plant Succession on Batteries.

In February, 1958 a freshly risen battery of the free floating type was found in Sapling Prairie. At that time it was raw peat. In September 1958 and In September, 1959, lists of the vegetation on this battery was

made as follows:

1958

Predominant

Xyris fimbriata  
Eleocharis sp.  
Hydrocotyle umbellata

Major Associates

Nuphar advena  
Hypericum virginica  
Cyperus sp.  
Dulichium arundinaceum  
Bidens coronata  
Ludwigia  
Gyrotheca tinctoria  
Pontederia cordata

Minor Associates

Habeneria repens  
Nymphaea odorata (abortive)  
Sagittaria graminea  
Panicum hemitomon  
Andropogon glomeratus

1959

Andropogon glomeratus  
Bidens coronata  
Hypericum virginica

Eleocharis sp.  
Dulichium arundinaceum  
Gyrotheca tinctoria  
Sphagnum  
Xyris fimbriata  
Hydrocotyle umbellata  
Sagittaria graminea  
Nuphar advena

Rhynchospora inundata  
Pontederia cordata  
Habeneria repens  
Sacciolepis striata  
Panicum hemitomon

A free floating battery which rose in the old Chesser Prairie boat run following the drouth in 1955 was checked in September 1958 and in September 1959. The following two columns would thus give the species after four and five growing seasons.

1958

Predominant

Gyrotheca tinctoria  
Ludwigia lanceolata  
Bidens coronata

Major Associates

Woodwardia virginica  
Xyris fimbriata  
Sagittaria graminea  
Sagittaria longirostra  
Hypericum virginicum

1959

Gyrotheca tinctoria  
Bidens coronata

Sagittaria graminea  
Hypericum virginicum  
Utricularia juncea  
Xyris fimbriata  
Eleocharis baldwinii  
Sacciolepis striata

1958Minor Associates

Sacciolepis striata  
 Dulichium arundinaceum  
 Rhynchospora inundata  
 Pontederia cordata  
 Habeneria repens  
 Girardia sp.

1959

Ericaulon compressum  
 Decodon verticillatus  
 Ludwigia lanceolata  
 Rhynchospora inundata  
 Sphagnum  
 Saggitaria longirostra  
 Woodwardia virginica  
 Habeneria repens  
 Taxodium distichum  
 Hydrocotyle umbellata  
 Andropogon sp.  
 Girardia sp.  
 Pontederia cordata

It is interesting that the first woody species, the pond cypress and water willow were found on the Chesser Prairie battery after the fifth season. Also four herbaceous species were found for the first time in 1959.

The Suwannee Canal cut-off has not been used since the 1954-1955 drouth. It is now covered with a dense floating mat of maidencane. This year a cursory check was made to see what other vegetation had intruded. Wampee, paintroot, water willow and even button bush were found.

III. SPECIES LISTS.A. Trees and Shrubs.

A tentative list of woody species of Okefenokee has been prepared and Dr. Wilbur Duncan of the University of Georgia will work with me in getting it in shape for publication. Care will be taken that the identification and status of each species listed is correct.

B. Reptiles, Amphibians and Fishes.

A tentative list of species of reptiles, amphibians and fishes that have been collected at Okefenokee has been prepared. Sources of information for this list have been collections at Cornell University and the National Museum, literature pertaining to collections made at Okefenokee, and reliable identifications of specimens that have been collected by refuge personnel.

I have asked advice about this list from Drs. Bernard Martof and Donald Scott, University of Georgia, and Dr. Roger Conant, Philadelphia Zoological Garden.



It appears that the list of reptiles and amphibians is fairly complete. Some thirty species of fishes that have been collected in Okefenokee are reported in literature but Dr. Scott advises me that because of taxonomic changes that have been made in some species since the Okefenokee collections were reported, further collecting will be necessary for proper identification. He plans to come to Okefenokee to work with me this spring.

#### IV. WILDLIFE INVENTORIES.

Biweekly trips have been made between Camp Cornelia and Gannet Lake and between Jones Island and the upper end of Big Water to count species of wildlife for the purpose of learning their abundance as compared with other seasons and years.

##### Cranes.

A decline in the numbers of resident and migrant sandhill cranes was indicated by this year's data. Probably the higher water levels of 1959 were unfavorable to them. Comparative figures based upon counts in Chesser, Grand and Gannet Lake Prairies are as follows:

	<u>1957</u>	<u>1958</u>	<u>1959</u>
Early July	4	0	0
Late July	2	2	4
Early August	0	-	0
Late August	6	0	-
Early September	2	2	-
Late September	4	0	7
Early October	4	8	-
Late October	19	19	-
Early November	43	0	2
Late November	45	-	31
Early December	39	8	23
Late December	14	191	23

##### Snipes.

In the fall of 1958 the water levels were low so that the prairies were only partly flooded. Snipes were abundant. 287 were observed along the boat run across for about a half mile between the Canal and Cooter Lake. By contrast, only an occasional snipe could be seen this fall. On trips across Chesser, Grand and Gannet Lake prairies this year, one snipe was seen November 3, one December 3 and one December 16.

### Ibises.

Both wood ibises and white ibises were present all summer and fall but in fewer numbers than during the same period last year. The highest number of wood ibises reported was 25 seen at Big Water August 29. Three were seen in the same locality December 16. White ibises were common all summer and fall with the highest number 162 seen at Big Water December 16.

### Waterfowl.

It is estimated that between 8,000 and 10,000 wood ducks are wintering in Okefenokee Swamp. Apparently this is the greatest concentration of this species since the refuge has been established. While wood ducks have undoubtedly increased, mallards have decreased. Usually on long trips into the swamp this winter, an observer will see scarcely more mallards than he will wood ducks and sometimes even fewer.

Black ducks, ringnecks, scaups, pintails, and hooded mergansers are present in small numbers.

### Bears.

Bear signs are still commonly seen along the north and northwest side of the swamp. A bear and a cub were seen in Mizell Prairie by Mr. Chesser July 9.

### Deer.

White-tailed deer on and around the refuge are doing well.

Track counts were made the day following rains in August along roads in typical deer habitat on and in the vicinity of the refuge. A method of converting the track count to an estimate of the density of deer is that used by the Florida Game and Fresh Water Fish Department. Following are the counts and computations:

<u>Locality</u>	<u>Miles Traveled</u>	<u>Actual Count of Tracks</u>	<u>Number Per Mile</u>	<u>Computed Number of Deer per Sq.Mi.</u>
Cowhouse	11.9	0	0	0
Toledo	7.4	31	4.19	3.35
Pocket	5.6	33	5.89	4.71
Sweetwater	2.2	3	1.37	1.10
St. Regis Pasture	8.6	85	9.88	7.90

Mean per square mile	-	3.41
Estimated number of acres of deer habitat on refuge		30,000
Estimate number of square miles deer habitat on refuge		47
Computed number of deer on refuge		160

Assuming that this estimate is correct, it does not follow that only 160 deer use the refuge. This could be taken as the average number at one time or at the time the count was made. There is considerably more deer habitat surrounding the refuge than there is on the refuge and it is to be expected that the number using the refuge at one time or another is considerably more than 160.

#### Fur Animals.

Raccoons are abundant around the edge of the swamp and on the island in the swamp.

Three otters were reported seen December 4 and one December 30 on Big Water run by Messrs. Hall and Cone.

#### Alligators.

The best counts of alligators are usually gotten between Billy's Lake and the Big Water cabin. This tabulation gives the counts made along these runs and the Billy's Lake water reading on those days:

ALLIGATOR COUNT

<u>Date:</u>	7/13	7/31	8/18	8/29	9/23	11/4	11/17	12/4	12/16	12/30
Number Seen	4	4	8	23	32	38	43	0	23	36
Gauge Reading	114.80	115.28	115.00	114.69	114.68	114.74	114.66	114.50	114.44	114.38
Temperature Range	89-70	90-72	90-69	94-70	87-65	85-56	68-60	66-37	78-58	66-39

### Species Card Indexes.

Cards have been prepared and entries been made for 222 species of birds, 58 species of reptiles and amphibians, 37 species of mammals and 164 species of plants. We have in our files records of many more than these and they will be entered as time permits.

### Collections.

To date 252 specimens of plants have been entered in the herbarium at the University of Georgia and have been assigned numbers. Duplicates of each specimen are retained here at the refuge.

### VII. WEED CONTROL.

The water hyacinth infestations at Manor, Ribbon's Pond, Argyle and Homerville have apparently been eliminated. Two other infestations have been found, one on U. S. Highway 441 near Tatum Creek and one along the road between Homerville and Cogdell. These last two infestations were treated. The Cogdell road infestation will probably require further treatments.

### VIII. NOXUREE BURNING STUDY.

A final report on this study was prepared and submitted separately.

### IX. PUBLIC RELATIONS.

Slide lectures on the Okefenokee Swamp were given to the Nahunta Garden Club on October 6 and the Folkston Lions Club, November 23/

A Christmas Bird Count was organized and made from Camp Cornelia on Januar 2nd and the results were reported to Audubon Field Notes. The details of this count were included in the September-December Narrative Report.

The following special visitors were taken on trips into the swamp and otherwise assisted:

7/16/59 - Russell Siverly, U. S. Public Health Service,  
Savannah, Georgia. Mosquitoes and Encephalitis.

8/14/59 - Charles Powell, University of Arizona. Pollen Distribution in peat.

8/29/59 - Mr. and Mrs. William Hueston, Audubon Society, Cocoa, Florida. Birds.

8/26/59 - Paul Bryan, T.V.A. Biologist, Decatur, Alabama.  
Trip into swamp.

- 9/12/59 - Dr. and Mrs. Ira Gabrielson, Wildlife Management Institute. Trip into swamp.
- 9/13/59 - Carl J. George, Harvard Biological Laboratories, Cambridge, Massachusetts. Ichthyological research.
- 9/23/59 - J. L. Lowe and R. L. Gilbertson, Syracuse, New York. Syracuse University. Fungi Research.
- 11/4/59 - Ed Cooper and William Hadley, St. Regis Paper Company, Fargo, Georgia. Trip into swamp.
- 11/9/59 - Dan Todd, U. S. Forest Service. Preparation of a series of photographs of the swamp.
- 11/23,24  
and 25/59-Dr. and Mrs. J. Chester Bradley, Cornell University, Trip into swamp.

#### X. SPECIAL ITEMS.

##### A. State Highway Department Data.

In 1934 the Georgia State Highway Department had a proposed project to build a scenic highway across Okefenokee Swamp. The highway was to extend from Waycross to Fargo. It was to enter the swamp at Hilliard Island and run to the lower end of Big Water, thence by Minnie's Lake to Billy's Island and from there southward across Billy's Island to the western tip of Honey Island, thence westward to the Fargo road. The attached map shows the approximate route. About 22 miles of this route was through swamp and the other 15 miles across upland including the islands. Soundings were made at 100' intervals through the swamp to determine peat depth. Also the kind of cover crossed by the route was mapped.

Mr. Morton requested the data from the State Highway Department and the Department obliged by sending complete copies of all data showing the map, the profile and the depths of the soundings.

The greatest peat depth on the proposed route was encountered near Big Water. This reading was 11.6 feet. There are known to be places in the swamp where the depth is more than 20 feet.

##### B. Cornell Literature.

On November 23, Dr. J. Chester Bradley, Professor Emeritus of Cornell University presented to the refuge on behalf of Cornell Professor Peter Paul Kellogg, a collection of scientific and historical works concerning the Okefenokee Swamp. This literature has been listed in the September-December Narrative Report. The refuge now has a fairly complete collection of the principal scientific and historical writings dealing with the Okefenokee.

C. Soils Types.

On September 10 and 11, Messrs. Norman Sands and D. Gray Aydlott of the local U. S. Soil Conservation Office, upon request, made tests around the perimeter of the swamp to determine soils types. The purpose of this cursory survey was to learn which types were best suited for hardwood timber. It was believed that this information would be useful in the refuge's timber management for selecting the most suitable sites for establishing hardwood islands in our pine woods.

Soils types identified were Lakeland, Blanton, Klej, Ona, Plummer, Rutledge and Leon. Thrifty hardwood stands were found on all of these types but fewer were found on the Leon type. It was believed that this was because this type, being of a more drouthy nature than any, except Lakeland, is subject to more frequent fires with the result that initial hardwood reproduction is more likely to be eliminated. Lakeland is more drouthy than Leon but since vegetation is more sparse on it, it is not as likely to be frequently burned

Respectfully submitted,

Eugene Cypert  
Refuge Biologist

Figure 1. Free floating type battery.

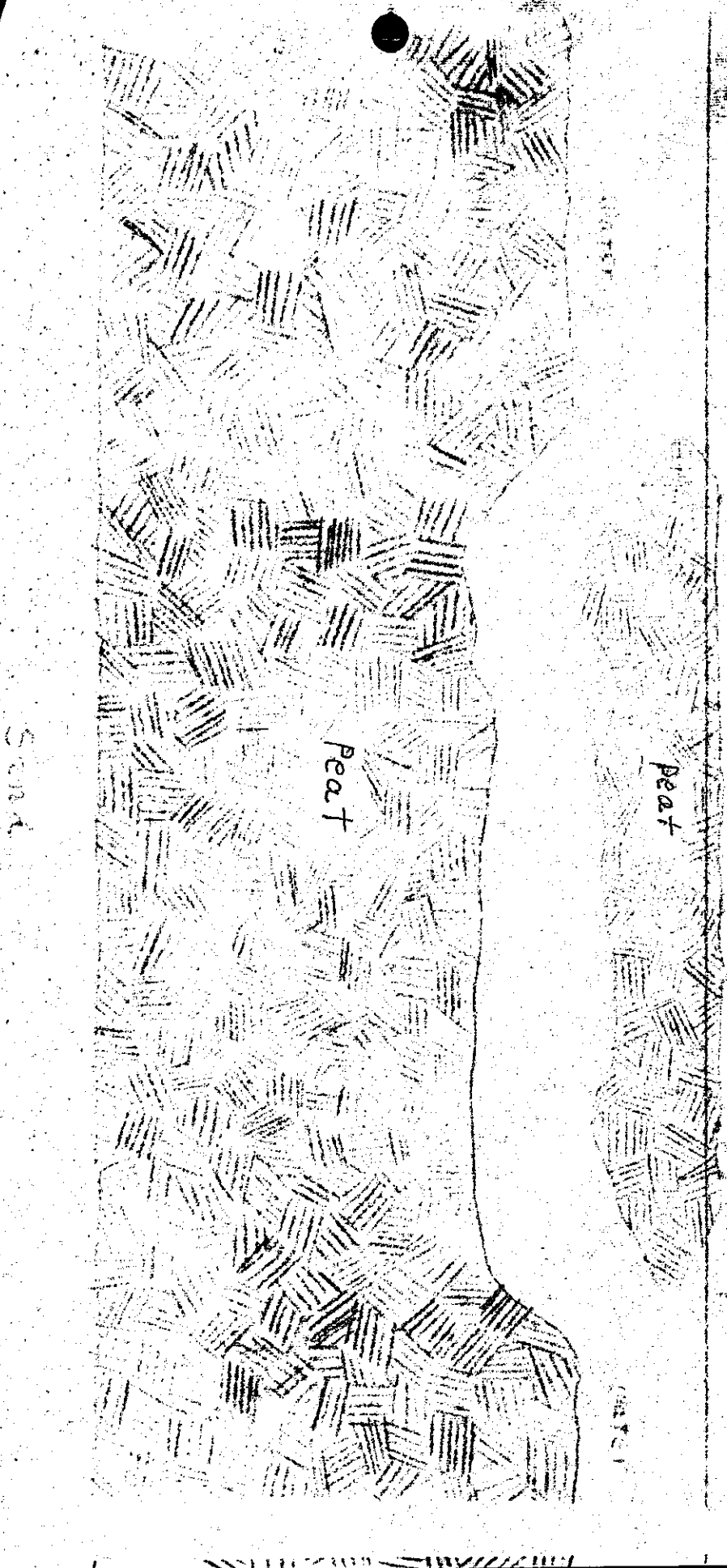




Figure 2. Bulge type of battery.

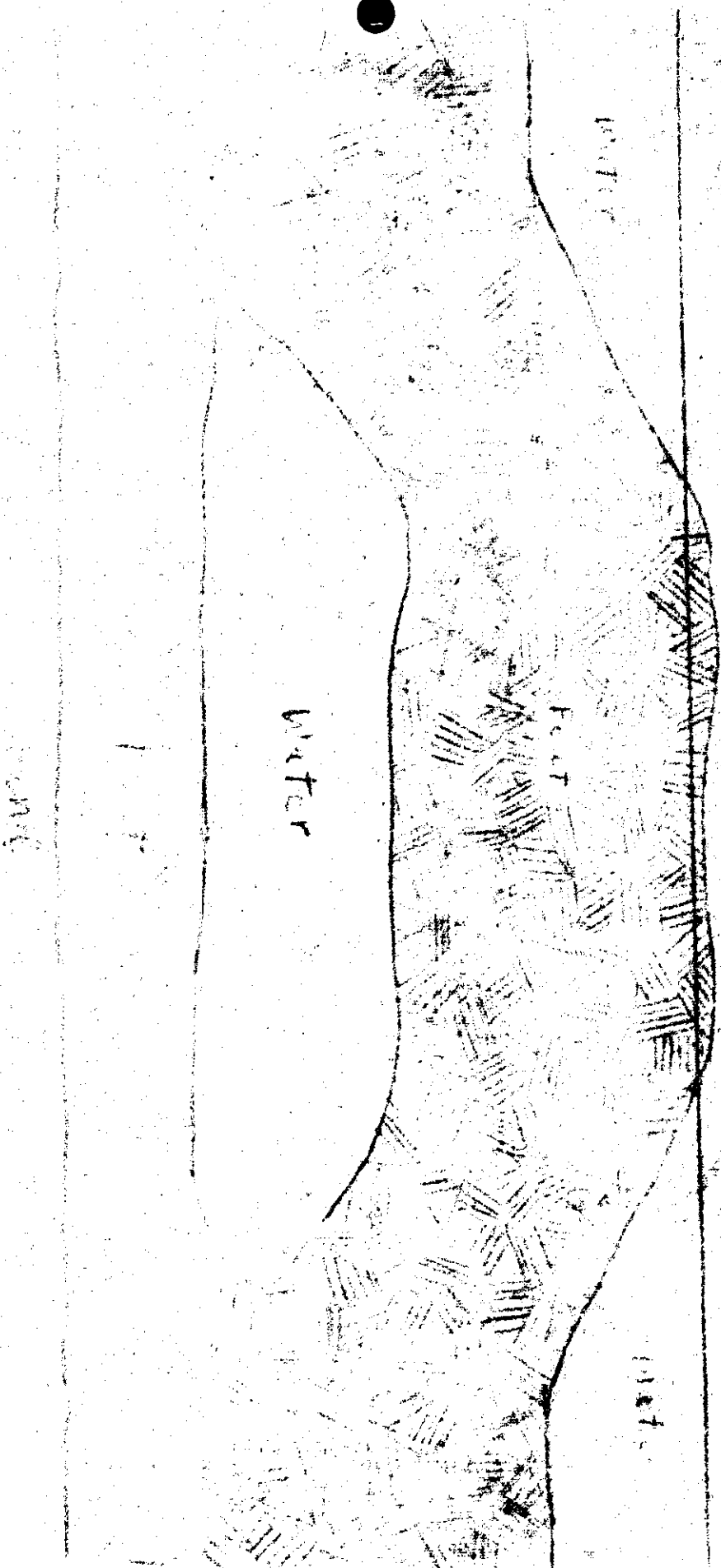
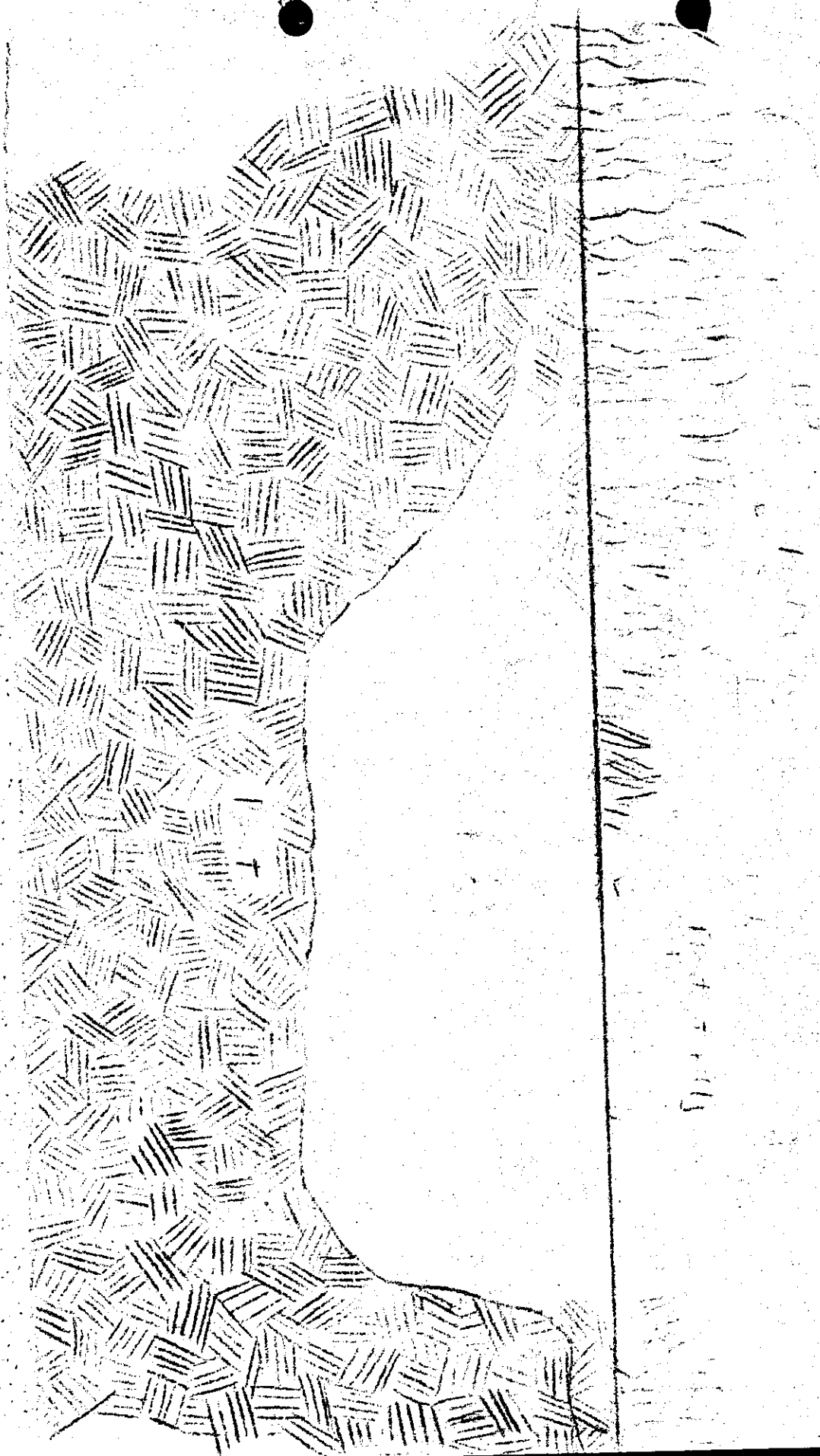


Figure 3. Edge accretion type of battery.

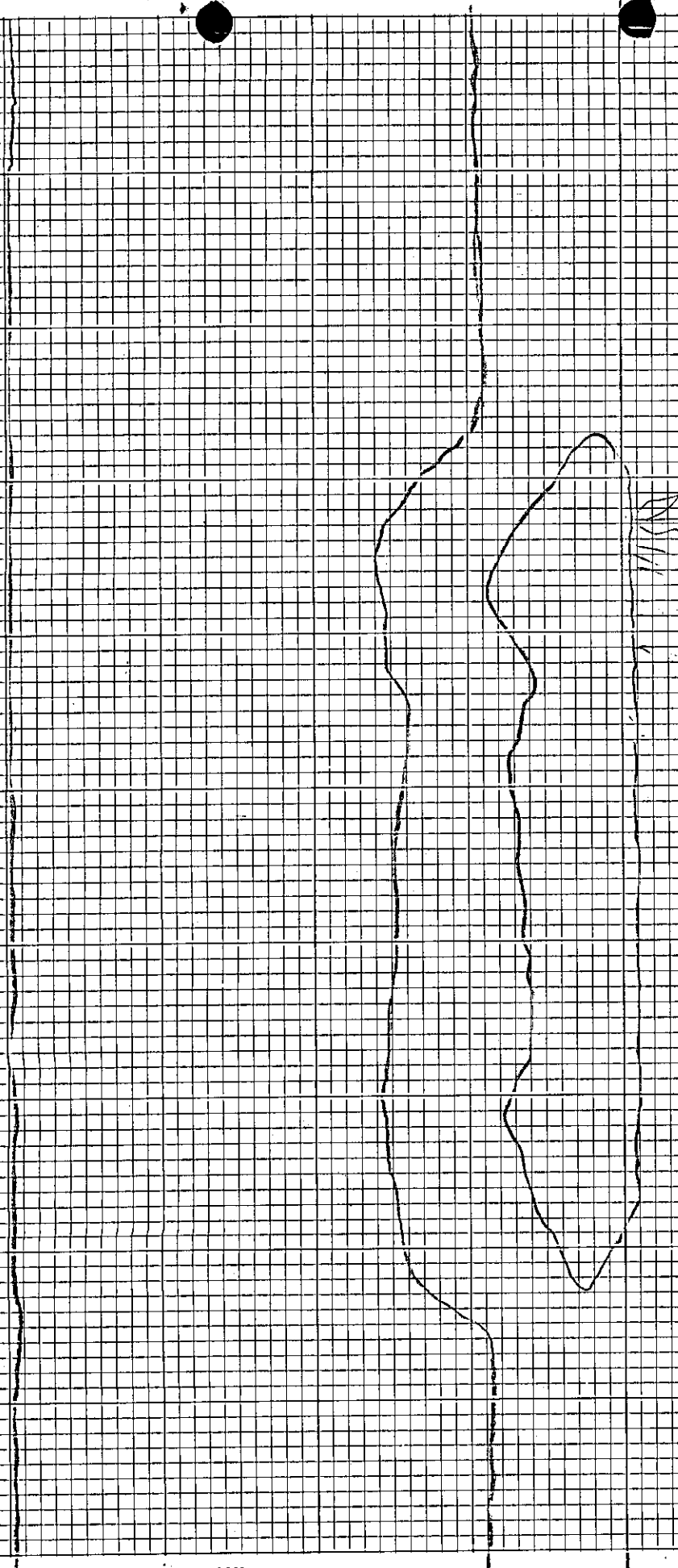


3

2.2



Explain the nature of the problem



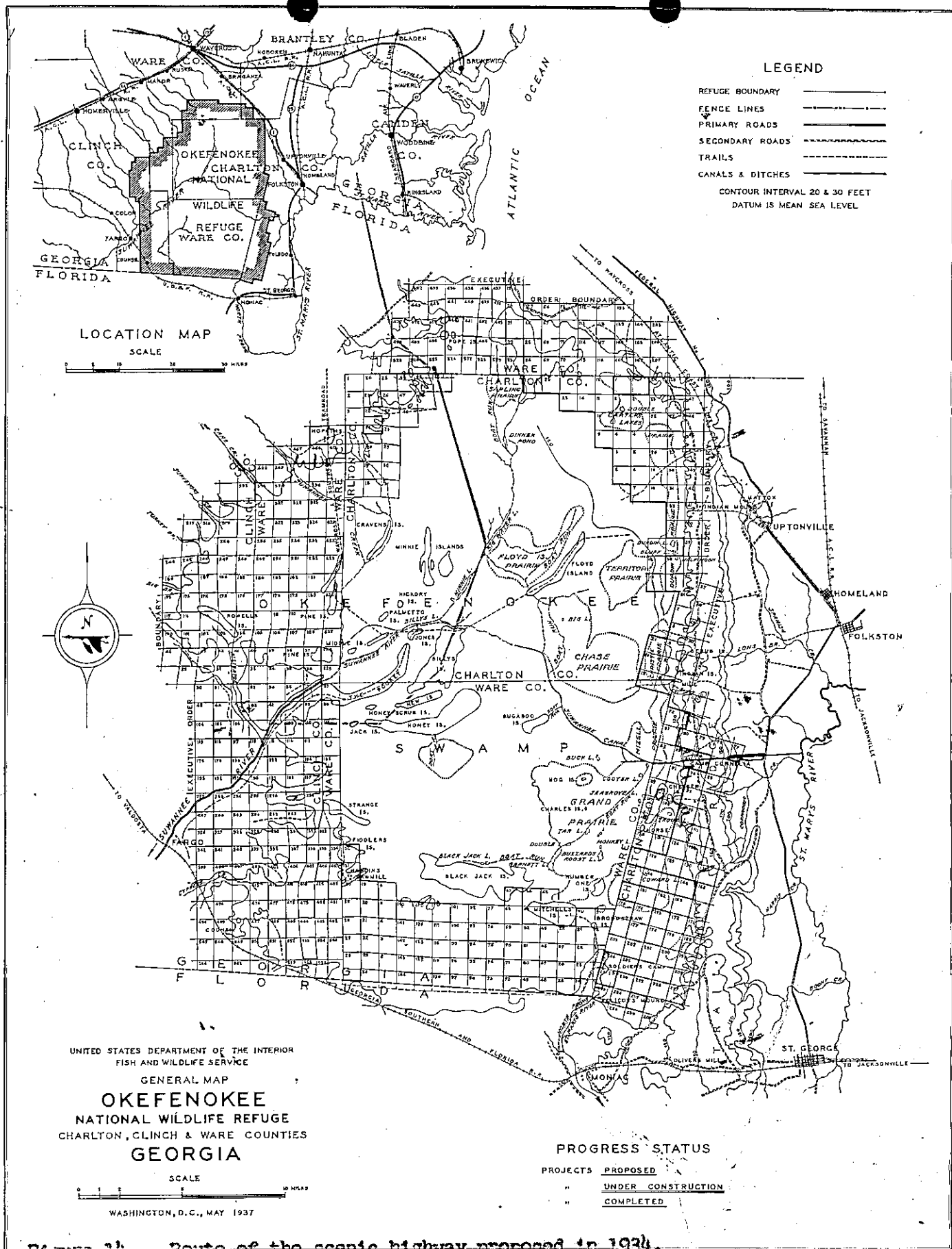


Figure 14. Route of the scenic highway proposed in 1934.